

## **DISPOSABLE GARMENT WITH REDUCED PARTICULATE SHEDDING**

### **TECHNICAL FIELD OF THE INVENTION**

The present invention relates generally to the field of safety apparel, and more specifically to a safety garment having reduced particulate shedding properties.

### **BACKGROUND OF THE INVENTION**

Safety garments, such as disposable smocks, jumpsuits, gloves, shoe coverings, and hair coverings, are required apparel for the performance of many jobs. Some of the jobs requiring safety garments are performed in clean room environments, wherein the introduction of foreign matter must be minimalized. For example, technicians in certain sensitive medical fields dealing with infectious matter, aerospace researchers assembling interplanetary probes, and material scientists developing and manufacturing ultrapure materials all wear safety garments in clean room environments. The safety garments perform the dual function of protecting the wearer from the potentially hazardous materials he is working with as well as preventing unwanted matter from the wearer's person from contaminating his work product.

Safety garments for use in clean room environments are typically made from nonwoven disposable materials, such as from sheets of spunbond/melt blown/melt blown/spunbond (SMMS) material and the like. Such sheets of material are cut into patterns and stitched together to form desired safety apparel. Typically, as these garments are intended to be disposable and the focus is on their functionality and not aesthetic appeal, little attention is paid to the hemming and stitching. The “as cut” edges are thus exposed. However, in clean room environments where contaminant levels in the parts per million or even parts per billion are too much, such exposed cut edges present genuine sources of potential particulate contamination.

Moreover, as these garments are intended to be disposable, little effort is made to provide durable stitching. The prevalent attitude is that a garment intended to be worn for just a few hours does not require superior stitching. However, in a clean room situation, seam separation is not only a potential source of particulate evolution in and of itself, but also produces a pathway from the interior to the exterior of the garment through which potentially hazardous material may flow.

There thus remains a need for a need for an improved safety garment that is more durable and less prone to particulate shedding. The present invention addresses this need.

### **SUMMARY OF THE INVENTION**

The present invention relates to a disposable clean room safety garment, including at least one sheet of nonwoven fabric having at least one cut edge, a plurality of stitches formed in the sheet(s) of nonwoven fabric to define a garment; and hemming formed at cut edges. The nonwoven fabric is preferably formed from spunbond/meltblown material. The stitching is characterized by an optimized stitch density of between ten and twelve stitches per inch.

One object of the present invention is to provide an improved safety garment. Related objects and advantages of the present invention will be apparent from the following description.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a perspective view of a first embodiment safety garment of the present invention.

FIG. 2 is an enlarged exploded partial view of a hemmed edge of the embodiment of FIG. 1.

FIG. 3 is a perspective view of a second embodiment safety garment of the present invention.

## **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

For the purposes of promoting an understanding of the principles of the invention and presenting its currently understood best mode of operation, reference will now be made to the embodiments illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, with such alterations and further modifications in the illustrated device and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

FIGS. 1 and 2 illustrate a first embodiment of the present invention, a reduced particulate shedding disposable nonwoven safety garment 10. In this embodiment, the safety garment is formed as a smock. The safety garment 10 is preferably made from spunbond/melt blown/melt blown/spunbond (SMMS) material, spunbond/melt blown/spunbond (SMS) material, or the like, and includes double-folded and hemmed edges 12. The edges 12 are folded such that all cut edges of the non-woven material are double-folded under so as to not be exposed. Non-exposure of the edges 12 thus greatly reduces the potential for generation of shed particles where the material was cut. The seams 16 are stitched with an optimization of the number of stitches per inch (SPI), increased to 10-12 SPI over the standard 6-8 SPI. 10-12 SPT has been found to be the optimal stitch density, as more than 12 SPI weakens the non-woven material via excessive perforation and less than 10 SPI provides a looser and weaker hem, such that particulate shedding is not minimized.

FIG. 3 illustrates a second embodiment of the present invention, a jumpsuit 10 made from spunbond/melt blown/melt blown/spunbond (SMMS) material, spunbond/melt blown/spunbond (SMS) material, or the like. The jumpsuit includes twice-folded and hemmed edges 12. As in the first embodiment, the edges 12 are folded such that all cut edges of the non-woven material are double-folded under so as to not be exposed. The seams 16 are stitched with an optimization of the number of stitches per inch (SPI), increased to 10-12 SPI over the standard 6-8 SPI. The garment also includes foot coverings 18, that are preferably stitched to the garment but may alternately be individually formed and attached, such as by an elastic band stitched into the hem at the foot opening. The garment 12 further includes an excess of material in the armpit 20 and groin/seat area 22, to minimize the risk of accidental tearing that might generate additional particulate matter into the environment as well as expose the wearer to environmental hazards.

In practice, the garments 10 are made by cutting one or more sheets of nonwoven material into a desired safety garment pattern. Simple patterns (i.e., shoe coverings) may require a single sheet; more complex patterns (i.e., smocks, jumpsuits, and the like) may require two or more sheets of varying size. The sheet(s) is/are then stitched together to define a garment 10. The edges of the garment 10 are then hemmed. All cut edges are twice folded and hemmed under to prevent exposure of any cut edges that could increase the likelihood of particulate shedding. All stitching is characterized by an optimized stitch density in the range of 10 to 12 stitches per inch.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character. It is understood that the embodiments have been shown and described in the foregoing specification in satisfaction of the best mode and enablement requirements. It is understood that one of ordinary skill in the art could readily make a nigh-infinite number of insubstantial changes and modifications to the above-described embodiments and that it would be impractical to attempt to describe all such embodiment variations in the present specification. Accordingly, it is understood that all changes and modifications that come within the spirit of the invention are desired to be protected.